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ABSTRACT

Differences in performance between male and female students in a combined baccalaureate and doctor of medicine (MD) degree program were studied. The University of Missouri-Kansas City offers a 6-year curriculum leading to both degrees. The study group consisted of all entrants into the program in 1972 through 1974 (n=219), 1978 through 1980 (n=280), and 1984 through 1986 (n=264). Women comprised 35% of the 1972 through 1974 matriculants, 46% of the 1978 through 1980 matriculants, and 50% of the 1984 through 1986 matriculants. Performance was measured through academic achievement, grade point average (GPA) and scores on National Board of Medical Examiners examinations (NBME) in years 5 and 6, and clinical performance evaluations. Possible explanations for observed differences were sought by comparing academic, personal, and social characteristics of the students upon entry into the program. Of the 219 students who entered the program in 1972 through 1974, 44 withdrew or were dismissed. Of the 280 students who entered the program in 1978 through 1980, 52 withdrew or were dismissed. Of the 264 students who entered the program in 1984 through 1986, 52 withdrew or were dismissed. Across all classes, clinical performance of women and men was on a par. Differences found in academic performance involved cumulative and science GPA in the baccalaureate program and scores attained on the NBME. These differences were largely confined to the classes of 1978 through 1980, in which men had outperformed women in these areas even in high school. In the years in which performance was more equal, women had entered the program with superior credentials. Implications of the suggestion that women ought to enter with superior preparation are discussed. Eight tables present study data. (SLD)

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PERFORMANCE OF MALE AND FEMALE STUDENTS IN A COMBINED BACCALAUREATE-M.D. DEGREE PROGRAM

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PERFORMANCE OF MALE AND FEMALE STUDENTS IN A COMBINED BACCALAUREATE-M.D. DEGREE PROGRAM

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Eighteen years ago, the University of Missouri-Kansas City (UMKC) initiated a new program in medical education which would offer students a six-year curriculum leading to the baccalaureate and M.D. degrees. The UMKC approach to the general professional education of physicians would be unlike any taken in this country's medical schools of that era. Its hallmarks would include:

- integration of the humanities, basic sciences, and clinical medicine throughout the six-year sweep with early and continuous patient care experience,
- an emphasis on problem-solving in small group settings,
- a strong student support system with close student-faculty interactions and cooperative peer relationships,
- continuous, comprehensive student evaluation emphasizing learning rather than grades, and
- admission of students directly upon high school graduation.

Almost since the School's inception, the percent of women in the UMKC applicant pool and in the entering classes has exceeded figures reported nationally for all U.S. medical schools. Currently, just over half of the student body are women. Thus, the School has a keen concern for the academic and professional development of its women students. Further, having enrolled substantial numbers of women, it has a fundamental interest in the proposition that occupational and professional parity among men and women can be attained through equal access to education, increased numbers of females in our educational institutions, and appropriate support systems.

The purpose of this presentation will be to describe trends in the performance of male and female matriculants since the School began and to propose explanations for observed differences in their performance.

Methods

The study group consists of all men and women in the entering classes of 1972 through 1974 (n = 219), 1978 through 1980 (n = 280), and 1984 through 1986 (n = 264). Women constituted 35% of the 1972-74 matriculants, 46% of the 1978-80 matriculants, and 50% of the 1984-86 matriculants. These nine entering classes were chosen for analysis in order to construct groups of similar size, maximize comparability and completeness of data sets across classes, and represent time periods of relative stability in educational policy during the School's existence.

Table 1 lists the performance measures studied. The measures include those which the School's promotion committee uses to make decisions about student progress in the program as well as those which have been shown to be related to clinical

performance after students graduate from the School (1,2). They index academic as well as clinical achievement of the students.

The data for these performance measures were collected as a part of the School's formal evaluation of student progress. Total scores for each student's performance on the Quarterly Profile Examination (QPE), an in-house comprehensive multiple-choice test which all students in the School take every three months; the National Board of Medical Examiners' examinations (NBME); and the clinical performance evaluations were used. The grade point average (GPA) reflects achievement in the baccalaureate portion of the program.

Differences in attrition among men and women students were studied through construction of contingency tables and χ^2 analysis with Yates' correction. Other differences in performance were established through the use of the Student's *t* test. The *p* level was set at .01 because of the large number of comparisons drawn.

Possible explanation for observed differences in the performance of male and female students was systematically sought by comparing the academic, personal, and psychosocial characteristics of the students at entry to the program. These characteristics include:

- composite and sub-scores on a national college admissions test,
- rank in high school class,
- number of semesters of high school science, mathematics, English, and foreign language,
- nonacademic achievement,
- self evaluation,
- scores on an occupational-interest inventory,
- ratings by high school teachers,
- interviews by admissions committee members,
- size of hometown and mother/father's education and occupation.

As Table 2 illustrates, richer data sets describing students'academic, personal, and psychosocial characteristics were available for the entering classes of 1978-80 and 1984-86. Differences between male and female students at entry were identified through the Student's *t* test with a *p* level set at .01.

Results

Performance of 1972-74 Matriculants

Of the 219 students who entered UMKC at Year 1 in 1972 through 1974, 44 either withdrew or were dismissed. The attrition among the female students was slightly higher than among the males (26% versus 17%). However, the difference was not statistically significant ($\chi^2 = 2.25$, 1 D.F., $p = .13$). Most of the attrition among both males and females occurred during the first two years of the program (3).

Table 3 shows no statistically significant differences in the mean levels of clinical performance which the men and women attained in the rotations examined. Comparison of the mean academic achievement among male and female medical students as they progressed through the program revealed only one statistically significant difference (Table 3). The total mean score of women on Part I of the NBME was lower than that of the men. The mean scores of women students on the

QPE, their cumulative mean GPAs, and their Part II NBME scores were not significantly different from the scores attained by the men.

In short, the academic and clinical performance of men and women in these classes was indistinguishable but for NBME Part I scores.

Performance of 1978-80 Matriculants

Of the 280 students who entered the School at Year 1 in 1978 through 1980, 52 students withdrew or were dismissed. The attrition rate of the women was twice that of the men (26% versus 13%) and was statistically significantly different ($\chi^2 = 6.94$, 1 D.F., $p = .008$). In addition, the academic achievement of the male students was significantly greater than that of their female counterparts, as indexed by cumulative GPAs in Years 1, 2, and 6; cumulative science GPAs in Years 2 and 6; QPE scores in Years 2 and 6; and scores on NBME Part I and Part II (Table 4). For the most part, the clinical performance of the men and women was no different (Table 4). Women students were rated significantly higher in the Year 3/4 pediatrics rotation and in the Year 5/6 obstetrics-gynecology rotation than the men, however.

Performance of 1984-1986 Matriculants

Of the 264 students who entered UMKC at Year 1 in 1984-1986, 52 withdrew or were dismissed to date. The attrition rate among the female students was slightly less than among the males (18% versus 22%), but it was not statistically significant ($\chi^2 = .508$, 1 D.F., $p = .48$).

Only academic performance measures are available for students in the 1984-86 classes at the time of this writing. Table 5 indicates that there are no significant differences between the academic achievement of the men and women in these classes, as revealed by both their cumulative GPAs and cumulative science GPAs in Years 1 and 2. NBME Part I scores of female students who entered in 1984 were lower than those of their male peers, but the difference in scores was not statistically significant (Table 5).

In sum, the academic performance of the female and male students in the 1984-86 entering classes has not been dissimilar (to date). Further, the academic performance of men and women in these classes is not dissimilar from that of the men and women in the classes of 1972-74. In contrast, the academic performance of the men and women in the entering classes of 1978-80 was significantly different.

Characteristics of Matriculants at Admission

One explanation for the patterns reported above in the performance of male and female medical students might lie in the academic, personal, and psychosocial attributes of the matriculants at time of admission to the program. It could be argued that differences in the achievement of men and women in the combined-degree program might reflect differences at the point of admission to the program. If so, then male and female matriculants in 1972-74 and in 1984-86 would be academically, personally, and psychosocially indistinguishable at the time of admission, while men and women in the 1978-80 classes would differ in these respects.

The data in hand lend some support to this line of reasoning but also suggest a potentially important qualification.

More specifically, comparison of the academic characteristics on admission of the men and women in the 1972-74 classes reveals no differences in the total scores they achieved on the college admissions test and in the amount of mathematics and science they studied in high school. However, female students had a significantly higher class rank in high school than did the males (Table 6); and they were more likely to have held a job in a health-related field before entry to the program than their male counterparts (Table 6). There were no other differences between the personal and psychosocial characteristics studied of these males and females at admission.

Inspection of the academic and psychosocial attributes of the male and female students in the 1984-86 classes shows no differences among these students with respect to rank in high school class; the amount of social studies, mathematics, biology, chemistry, and other science they studied in high school; the composite score on the college admissions test; most measures of nonacademic achievement; self evaluations; most of the scales on the occupational interest inventory; ratings by high school teachers; admissions interviews; size of hometown; and mother/father's occupation. But, as Table 7 indicates, women in the 1984-86 classes scored significantly higher on the English portion of the college admissions test than the men. Their preparation in foreign language was greater than that of the men, and their nonacademic achievement in speech and writing was superior. They were more likely to have held a job in the health-related field and to have mothers with more years of education. On the other hand, the males in the entering classes of 1984-86 had higher sub-scores on the science portion of the college admissions test, had studied somewhat more physics in high school, and had higher scores on the technical scale of the occupational-interest inventory (Table 7).

In the 1978-80 entering classes, men and women students were no different on admission with regard to rank in high school class; high school preparation in the various academic areas; total score on the college admissions test; most of the scales tapping nonacademic achievement, self evaluation, and occupational interests; ratings by high school teachers; admissions interviews; and mother/father's occupation. Where differences appeared, however, the males surpassed the females with significantly higher scores on the mathematics and science portions of the college admissions test; higher nonacademic achievement in science, athletics, and overall participation in extra-curricular activities; and higher self evaluations on the ability to make decisions and knowledge of the sciences (Table 8). Also, males had fathers with more education (Table 8).

In sum, in those entering classes of 1972-74 and 1984-86, where both the performance of male and female medical students tended to be more similar than different, most of the entering academic, personal, and psychosocial characteristics of the women were not distinguishable from the attributes of the men. At the same time, however, the women students excelled relative to the men in apparently several important areas, most notably language skills and work experience in health. In contrast, in the entering classes of 1978-80, where the academic performance of male students was higher than that of the females, the men on admissions exhibited stronger academic and extracurricular qualifications, notably in the sciences, rated themselves higher in the sciences and in decision-making ability, and were more interested in technical matters than were the women.

Summary and Discussion

The academic and clinical performance of male and female medical students in nine classes of a combined baccalaureate-M.D. degree program was examined.

Across all classes for which comparisons were possible, the women performed in clinical rotations at least on a par with their male peers. This result echoes findings reported by two other medical schools (4, 5). In the two instances where differences between male and female clinical performance emerged in the present study, women outperformed men, in pediatrics and obstetrics-gynecology which are areas of long-standing interest to women in medicine.

Differences in the academic performance of the male and female medical students in the combined-degree program were found. These differences involved cumulative and science GPAs in the baccalaureate portion of the program and scores attained on standardized multiple-choice tests covering the basic sciences as well as the major areas of clinical medicine. As in the present instance, other authors have recorded lower basic science GPAs and NBME Part I scores for women relative to men (6, 7); yet research from still other medical schools did not uncover such disparities between their male and female students (5, 7). Indeed, the differences obtained here were largely confined to the academic performance of men and women in the entering classes of 1978-80.

These differences in the academic performance of the males and females in the combined degree program could reflect some differences noted among the men and women upon admission to the program. More specifically, men in the 1978-80 classes on average outperformed their female counterparts in mathematics and the sciences not only on college entrance tests but also in extra-curricular activities in high school; and they saw themselves as more knowledgeable in the sciences and more able to make decisions. Further, in the classes in which the academic performance of the men and women tended to be indistinguishable, the female students had entered the program with some superior credentials, particularly in language and health care. These results suggest that women might need to be more able and better prepared in some respects than men at the outset if they are to perform as well academically as their male peers in the program.

This possibility needs to be substantiated. Necessary further work includes continuing documentation and analysis of the academic and clinical performance of students in the 1984-86 classes still in the program, analysis of performance and entering characteristics of students in the classes not included in this research, and correlational analysis of the potential association between performance and the characteristics on which men and women differed at admission.

If this additional work corroborates the results reported above, it could pose an intriguing dilemma for the admissions committee -- should and could the committee knowingly expect female applicants to meet higher standards than male applicants?

These results also raise questions about the educational processes operative in the combined degree program. For example, what is it about the process that would make it more difficult for women who do not surpass their male peers at the beginning of the program to achieve on an academic par with them later? That sort of question in turn underscores the importance of ongoing work which is examining the fit between students' learning preferences, participation styles in the educational process, the cooperative learning model espoused by the clinical faculty, and the teaching model utilized by the basic science faculty.

A final comment on the importance of the differences obtained in male and female medical student performance. Some of the disparities, such as the .3 point

difference noted in male/female clinical performance in obstetrics-gynecology or the .2 point difference in male/female GPAs, are only significant statistically; for the levels attained by both males and females are above average. Other differences, however, hold real consequences for gaining entrance to the profession. These include the differential attrition rate, GPA differences which could lead to dismissal or subsequent compromised performance in the program, and disparities on National Board examinations which are used in the selection of graduates for residency training positions. These are the differences which deserve serious attention in future work.

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Table 1. Performance Measures to Compare Male and Female Medical Students Academically and Clinically

Achievement Measure	Point in the Curriculum
Attrition	Throughout the 6 years
Academic Achievement	
Cumulative GPA	Year 1, 2, 6
Cumulative Science GPA	Year 1 ,2, 6
Quarterly Profile Examination	Year 1, 2, 6
National Board Part I	Year 5
National Board Part II	Year 6
Clinical Performance Evaluations	
Introductory Medicine	Year 1
Obstetrics-Gynecology	Year 2, 5 or 6
Pediatrics	Year 2, 3 or 4, 5 or 6
Internal Medicine	Year 3, 4, 5, 6
Surgery	Year 5 or 6

Table 2. Academic, Personal, and Psychosocial Characteristics Used to Compare Male and Female Students on Entry to UMKC

Student Characteristics	Data Available for Entering Classes		
	1972-74	1978-80	1984-86
College Entry Test Score			
Total	x	x	x
Sub-scores		x	x
Rank in High School Class	x	x	x
Semesters of High School			
Science	x	x	x
Math	x	x	x
English		x	x
Foreign Language		x	x
Social Studies		x	x
Nonacademic Achievement			
# of books read	x	x	x
# of activities	x	x	x
Job in health	x	x	x
ACT ratings in 9 areas		x	x
Self evaluation			
Total rating	x	x	x
Sub-scores		x	x
ACT Interest Inventory		x	x
References	x	x	x
Interviews	x	x	x
Size of hometown	x	x	x
Mother/father's			
Occupation	x	x	x
Education		x	x
Motivation for medicine		x	x

Table 3. Achievement Levels of Male and Female Medical Students in the 1972 -1974 Entering Year 1 Classes at UMKC (3)

Achievement Measure	Male x	Female x	t	p
Clinical Performance Evaluations*				
Medicine Year 1	6.7	6.6	0.25	.80
Pediatrics Year 2	6.7	6.5	1.77	.08
Ob-Gyn Year 2	6.9	7.0	-0.69	.49
Medicine Year 3	6.1	6.3	-0.77	.44
Pediatrics Year 3/4	6.1	6.1	-0.68	.50
Medicine Year 4	6.6	6.7	-0.77	.44
Ob-Gyn Year 5/6	6.7	6.8	-0.49	.63
Surgery Year 5/6	6.7	6.7	-0.07	.94
Medicine Year 6	7.4	7.3	0.43	.67
Academic Achievement**				
QPE % Correct Year 1	38%	38%	-0.29	.77
Cum GPA Year 1	3.2	3.2	0.53	.60
QPE % Correct Year 2	42%	42%	0.74	.50
Cum GPA Year 2	3.3	3.2	0.47	.64
NBME I	479	424	3.32	.001
NBME II	487	464	1.49	.14
QPE % Correct Year 6	68%	64%	1.93	.06
Cum GPA Year 6	3.5	3.4	1.33	.19

*Student achievement in clinical rotations is measured on a nine-point scale with ratings of 1 through 3 labelled as unsatisfactory, ratings of 4 through 6 as satisfactory, and ratings of 7 through 9 as superior.

**GPAs are measured on a 4.0 scale. A passing score for NBME I is 380 and for NBME II 290.

Table 4. Achievement Levels of Male and Female Medical Students in the 1978-1980 Entering Year 1 Classes at UMKC

Achievement Measure	Male $\bar{x}$	Female $\bar{x}$	t	p
Academic Achievement				
QPE % Correct Year 1	36%	34%	1.82	.07
Cum GPA Year 1	3.5	3.3	3.32	.001
QPE % Correct Year 2	47%	43%	3.42	.0007
Cum GPA Year 2	3.5	3.3	2.51	.01
Cum Science GPA Year 2	3.4	3.1	3.57	.0004
NBME Part I	526	458	4.14	.0001
NBME Part II	516	460	4.03	.0001
QPE % Correct Year 6	71%	63%	4.52	.0001
Cum GPA Year 6	3.5	3.4	2.69	.007
Cum Science GPA Year 6	3.5	3.3	3.67	.0003
Clinical Performance Evaluations				
Pediatrics Year 2	6.4	6.5	-1.06	.29
Ob-Gyn Year 2	6.2	6.1	0.04	.97
Medicine Year 3	6.6	6.5	0.72	.47
Pediatrics Year 3/4	5.9	6.2	-2.56	.01
Medicine Year 4	6.9	6.7	1.47	.14
Medicine Year 5	7.2	6.9	1.81	.07
Pediatrics Year 5	6.8	6.8	-0.05	.96
Ob-Gyn Year 5/6	7.0	7.3	-2.83	.005
Surgery Year 5/6	6.6	6.9	-2.14	.03
Medicine Year 6	7.5	7.3	1.46	.15

Table 5. Achievement Levels of Male and Female Medical Students in the 1984-86 Year 1 Entering Classes at UMKC

	Male	Female		
Achievement Measure	x	x	t	p
Cum GPA Year 1	3.3	3.3	0.74	.46
Cum Science GPA Year 1	3.3	3.2	1.74	.08
Cum GPA Year 2	3.2	3.3	-0.49	.63
Cum Science GPA Year 2	3.1	3.1	0.57	.57
NBME I*	515	453	1.99	.05

*Only those students who entered in 1984 have reached the point in the curriculum where they are ready to sit for this examination.

Table 6. Significantly Different Academic and Psychosocial Characteristics of Male and Female Medical Students at Time of Admission to the Entering Classes of 1972-74 at UMKC

	Male	Female		
Characteristic	x	x	t	p
Percentile Class Rank	90	94	-2.75	.006
Nonacademic Achievement				
Job in Health*	1.8	2.4	-5.49	.0001

Table 7. Significantly Different Academic and Psychosocial Characteristics of Male and Female Medical Students at Time of Admission to the Entering Classes of 1984-86 at UMKC

	Male	Female		
Characteristic	x	x	t	p
Percentile ACT English	88	91	-2.97	.0032
Semesters Foreign Language	4.2	5.3	-3.13	.002
Nonacademic Achievement				
Speech*	1.8	2.2	-2.53	.01
Writing*	2.5	3.0	-3.63	.0003
Job in Health*	2.5	2.8	-4.27	.0001
Mother's Education**	4.4	4.7	-2.59	.01
Percentile ACT Science	94	89	4.32	.0001
Semesters Physics	2.0	1.8	2.57	.01
Interest Inventory				
Percentile Technical	47	36	2.46	.01

*Measured on a four-point scale with four defined as high achievement. Ratings of nonacademic achievement in speech and writing were taken from the ACT Student Report. Ratings of work experience in health came from the UMKC supplemental application.

**Measured on six-point scale with six defined as graduate/professional degree.

Table 8. Significantly Different Characteristics of Male and Female Medical Students on Admission to the Entering Classes of 1978-80 at UMKC

	Male	Female		
Characteristic	x	x	t	p
Percentile ACT Math	90	85	3.64	.0003
Percentile ACT Science	89	84	2.96	.0033
Nonacademic Achievement				
Science*	2.9	2.5	2.47	.01
Athletics*	3.2	2.7	4.92	.0001
Number of Activities*	2.8	2.5	2.54	.01
Self Evaluation				
Ability to Make Decisions**	3.8	3.6	2.58	.01
Knowledge of Sciences**	3.8	3.6	2.53	.01
Father's Education+	5.1	4.7	2.54	.01

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*Measured on a four-point scale with four defined as high achievement. Ratings of nonacademic achievement in science and athletics came from the ACT Student Report. Number of extracurricuar activities were derived from the UMKC supplemental application.

**Measured on a four-point scale with four defined as high. These self-ratings were taken from the UMKC supplemental application.

+Measured on a six-point scale with six defined as graduate/professional degree.